RESEARCH DEPARTMENT

PETERBOROUGH: TELEVISION AND V.H.F. SOUND SERVICES: SITE TESTS

Report No. K-136

(1959/10)

THE BRITISH BROADCASTING CORPORATION
ENGINEERING DIVISION

B.B.C. Research Department

ERRATA

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Page 1, Section 2 (General), line 6: "four tiers" *should read* "eight tiers"

line 9: "0·5 kW" *should read* "approximately 0·4 kW"

Page 4, Fig. 2 - Aerial: "four tiers" *should read* "eight tiers"

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SUMMARY

The results of a site test at Morborne Hill, near Peterborough, are given. A Band I transmitter with a mean effective radiated power (e.r.p.) of 1·1 kW will provide a much improved service over most of the area but the overlap with the adjacent Crystal Palace and Holme Moss transmitters is inadequate in certain areas. A Band II transmitter with a mean e.r.p. of 11·3 kW will fill the gap in the service areas of the adjacent v.h.f. sound transmitters, with the exception of two areas. Of these areas, the larger, that in the south-west, may be served by the proposed Central Berks. v.h.f. transmitter.

1. INTRODUCTION

The original television distribution plan did not provide for a Band I television service over a large area around Peterborough, bounded by the 0·1 mV/m contour of Holme Moss to the north, Norwich to the east, Crystal Palace to the south and Sutton Coldfield to the west. This area measures approximately 500 sq miles (800 sq km), but if fading and co-channel interference are taken into account the area with a poor service is much larger.

It has now been decided to provide this area with a television and a v.h.f. service.

2. GENERAL

The geographically adjacent television transmitters occupy Channels 1 to 4, therefore the only channel available for the Peterborough transmitter is Channel 5, co-channel with Wenvoe (vertically polarized) and Pontop Pike (horizontally polarized). Wenvoe is the nearer and more powerful transmitter and it follows, therefore, that mutual co-channel interference will be a minimum if the Peterborough transmission is horizontally polarized. The proposed aerial will consist of eight tiers of six radial unipoles fed in phase rotation and mounted on a 6 ft 6 in. (2 m) diameter cylinder. The resulting h.r.p., shown in Fig. 1(a), is substantially omnidirectional and for a transmitter power of approximately 0·4 kW the mean e.r.p. is 1·1 kW. The mean aerial height will be 418 ft (127 m) above ground level.

The gap in the v.h.f. sound service is rectangular in shape, its major axis lying approximately north/south. It is proposed to use a directional unipole-V aerial consisting of sixteen tiers of radial unipoles in the main plane at 99° and four tiers of radial unipoles in subsidiary plane at 189°; the unipoles in both planes will be fed with equal currents in antiphase. The e.r.p. will vary from approximately 1·0 kW to 21 kW for a transmitter power of 2 kW, maxima at 30° and 170°. The mean aerial height will be 325 ft (99 m) above ground level; the h.r.p. is shown in Fig. 1(b).

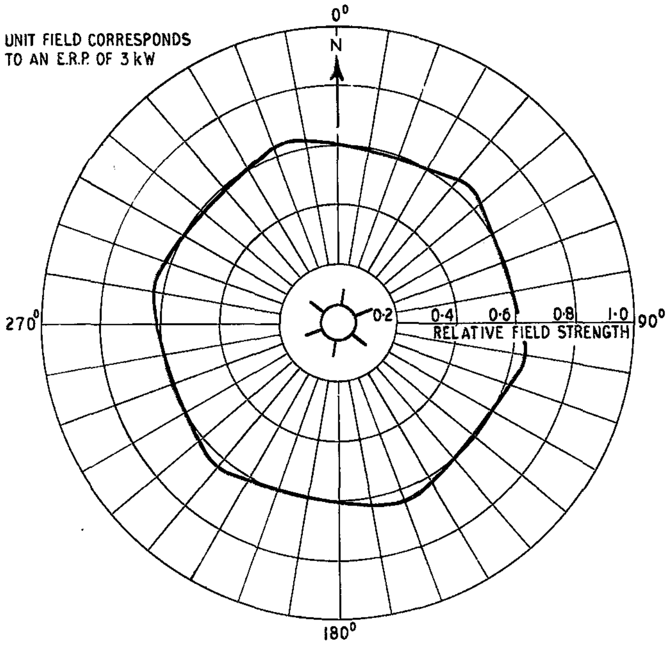


Fig. 1(a) - H.R.P. of Peterborough Channel 5 transmitter

All test transmissions were radiated on a frequency of 66·75 Mc/s by a balloon-borne omnidirectional aerial 400 ft (122 m) above ground level and the field strength values used for the television contour map have been corrected to correspond to the h.r.p. of Fig. 1(a). For the v.h.f. sound service area the values have been corrected to correspond to the h.r.p. of Fig. 1(b) and for the appropriate transmitter aerial height and frequency. All field strength values are quoted for a receiving aerial 30 ft (9·1 m) above ground level.

The preferred site for the Peterborough transmitter was near the village of Haddon, 5½ miles (9 km) south-west of Peterborough. It was, however, rejected on account of the excessive length of access road required.

The tests described in this report were made at Morborne Hill, a site 184 ft (56 m) above mean sea level and 6 miles (9·5 km) south-west of Peterborough. Site details are given in the Appendix.

3. RESULTS

The results of the tests are presented in two field strength contour maps, one for the television service and one for the v.h.f. sound service. The values of field strength exceeded at 10%, 50% and 90% of the locations in the principal towns are given in Table 1.

3.1. Television Service

The television service area map (T.464), Fig. 2, shows, in addition to the usual contours, the field strength value free from co-channel interference for 90% of the time. Also shown are the 0·1 mV/m contours and the areas free from co-channel interference for 90% of the time of the geographically adjacent television transmitters.

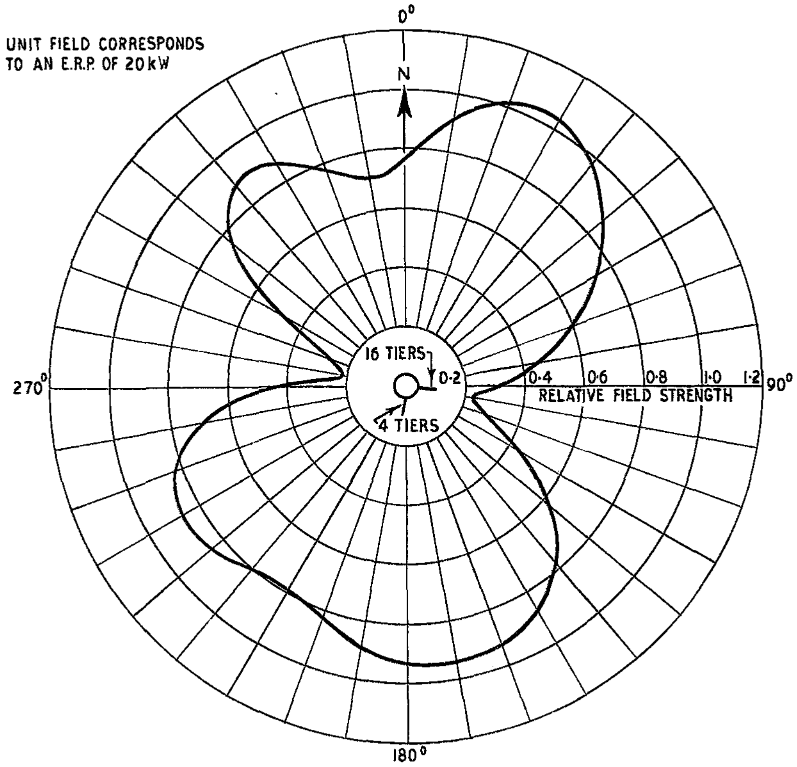
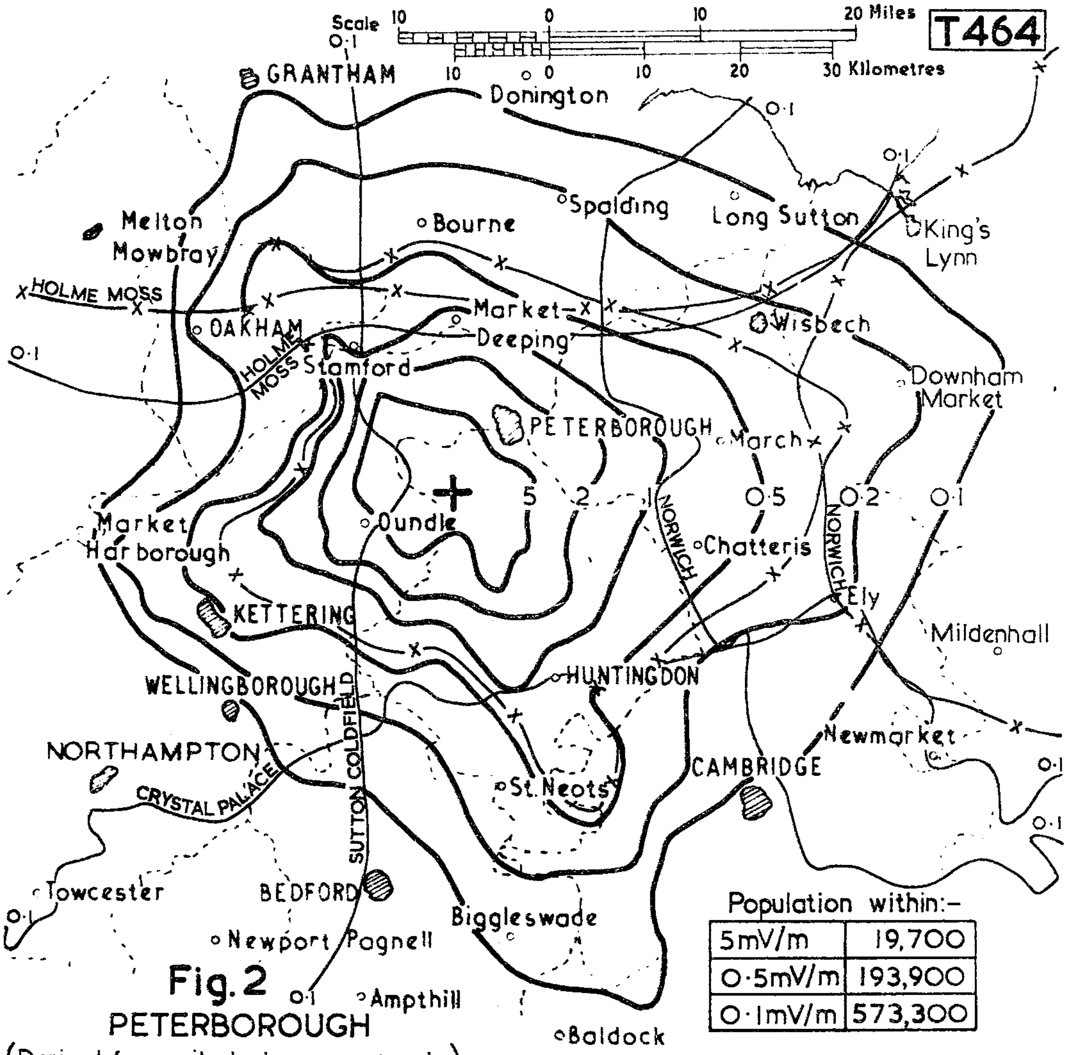


Fig. 1(b) - H.R.P. of Peterborough Band II transmitter

From Fig. 2 it will be seen that the proposed Morborne Hill transmitter will go a long way towards filling the gap between the service areas of the adjacent transmitters. Peterborough, Huntingdon and Stamford will be well served but the relatively large towns, Kettering, Oakham, Spalding and Wisbech, while having for most of the time a good service will, occasionally, be subject to co-channel interference. It should, in fact, be noted that because yet another transmitter has been squeezed into an already overcrowded band perceptible co-channel interference will restrict the service of the Peterborough transmitter for 10% of the time to field strengths varying from 0·3 mV/m to the east to 0·65 mV/m to the west of the transmitter. It should also be noted that while the 0·1 mV/m contour of Peterborough will overlap that of the adjacent transmitters the service in certain areas and large towns cannot be regarded as satisfactory. For example, Cambridge and Bedford are beyond the 0·1 mV/m Peterborough contour and each receives a median field strength of only 0·2 mV/m from Crystal Palace - a signal strength inadequate for such large industrial towns. The Peterborough television transmission does not extend as far as East Lincolnshire and this area must still receive its television service from Holme Moss. The southernmost part of East Lincolnshire is expected to get a much better service if the proposals for increasing the e.r.p. of the Norwich transmitter are adopted but an additional transmitter will still be required if an adequate service is to be provided for the remainder of East Lincolnshire.

Details of the field strength in the principal towns in the area are given in Table 1 below.



Population within:-

5mV/m	19,700
0·5mV/m	193,900
0·1mV/m	573,300

Fig. 2

PETERBOROUGH

(Derived from site test measurements)

Channel 5 (66·75 Mc/s)

Site height: 184 ft (56m) AMSL

Aerial height: 418 ft (127m) AGL

E.R.P: Approx. 1 kW

Polarization: Horizontal

Aerial: Eight tiers of six radial unipoles fed in phase rotation and mounted on a 6ft 6in (2m) diameter cylinder.

——x—— Limit of service area free from perceptible interference from co-channel transmitters for 90% of the time estimated from the C.C.I.R. Tropospheric Curves.
The protection ratio on which the estimates are based is 30dB with a reduction of 10dB for crossed-polarization.

———— 0·1 mV/m contours for Crystal Palace, Sutton Coldfield, Holme Moss, Norwich.

Note:
The contours represent field strength in mV/m at 30 ft (9·1m) above ground exceeded at 50% of receiving sites in a given locality. The value exceeded at 90% of receiving sites may be as much as 10dB below the value indicated by the contours particularly in hilly and built-up areas.

TABLE 1. (Television Service)

Field strength in mV/m at 30 ft (9·1 m) a.g.l.

Mean e.r.p. = 1·1 kW

Town	Value of field strength exceeded at stated percentage of localities		
	10%	50%	90%
Baldock	0·1	0·06	0·04
Bedford	0·09	0·06	0·04
Biggleswade	0·23	0·13	0·07
Boston	0·09	0·06	0·05
Bourne	0·56	0·4	0·28
Cambridge	0·11	0·09	0·07
Chatteris	0·96	0·6	0·4
Ely	0·42	0·25	0·13
Godmanchester	0·7	0·5	0·3
Grantham	0·06	< 0·04	< 0·04
Huntingdon	0·68	0·5	0·35
Kettering	0·4	0·2	0·12
King's Lynn	0·09	0·07	0·05
March	0·75	0·5	0·33
Market Harborough	0·1	0·07	0·05
Melton Mowbray	0·06	0·04	< 0·03
Oakham	0·55	0·4	0·24
Oundle	5·0	2·5	1·2
Peterborough	8·0	4·0	1·6
Royston	0·19	0·11	0·05
Rushden	0·33	0·16	0·07
Spalding	0·35	0·25	0·16
Stamford	1·7	0·8	0·35
St. Ives	0·45	0·3	0·2
St. Neots	0·38	0·24	0·15
Whittlesey	3·8	2·1	1·2
Wisbech	0·38	0·25	0·17

3.2. V.H.F. Sound Service

The v.h.f. service area map (F.125), Fig. 3, shows the 1·0 mV/m and 0·25 mV/m contours for the proposed Morborne Hill site and the 0·25 mV/m contours of the geographically adjacent transmitters.

The Morborne Hill transmission will not completely close the gap between the adjacent transmitters but it is expected that, with the addition of the Central Berks. v.h.f. transmitter, most of the area will be within a 0·25 mV/m contour.

Table 2 shows the field strengths in the principal towns.

4. CONCLUSIONS

The proposed Band I television transmitter will greatly improve the service in the Peterborough area. The overlap with the Crystal Palace and Holme Moss service areas is not, however, really adequate. In particular Cambridge and Bedford, both outside the service area of the proposed Peterborough transmitter, are not adequately served by Crystal Palace. East Lincolnshire, also beyond the service area of the Peterborough transmitter, is not adequately served by Holme Moss and even if the e.r.p. of the Norwich transmitter is increased to 100 kW in this direction an additional low-power transmitter will be required to serve most of the area. Attention is drawn to the fact that co-channel interference will be responsible for restricting the service area part of the time.

F125

Fig. 3

PETERBOROUGH

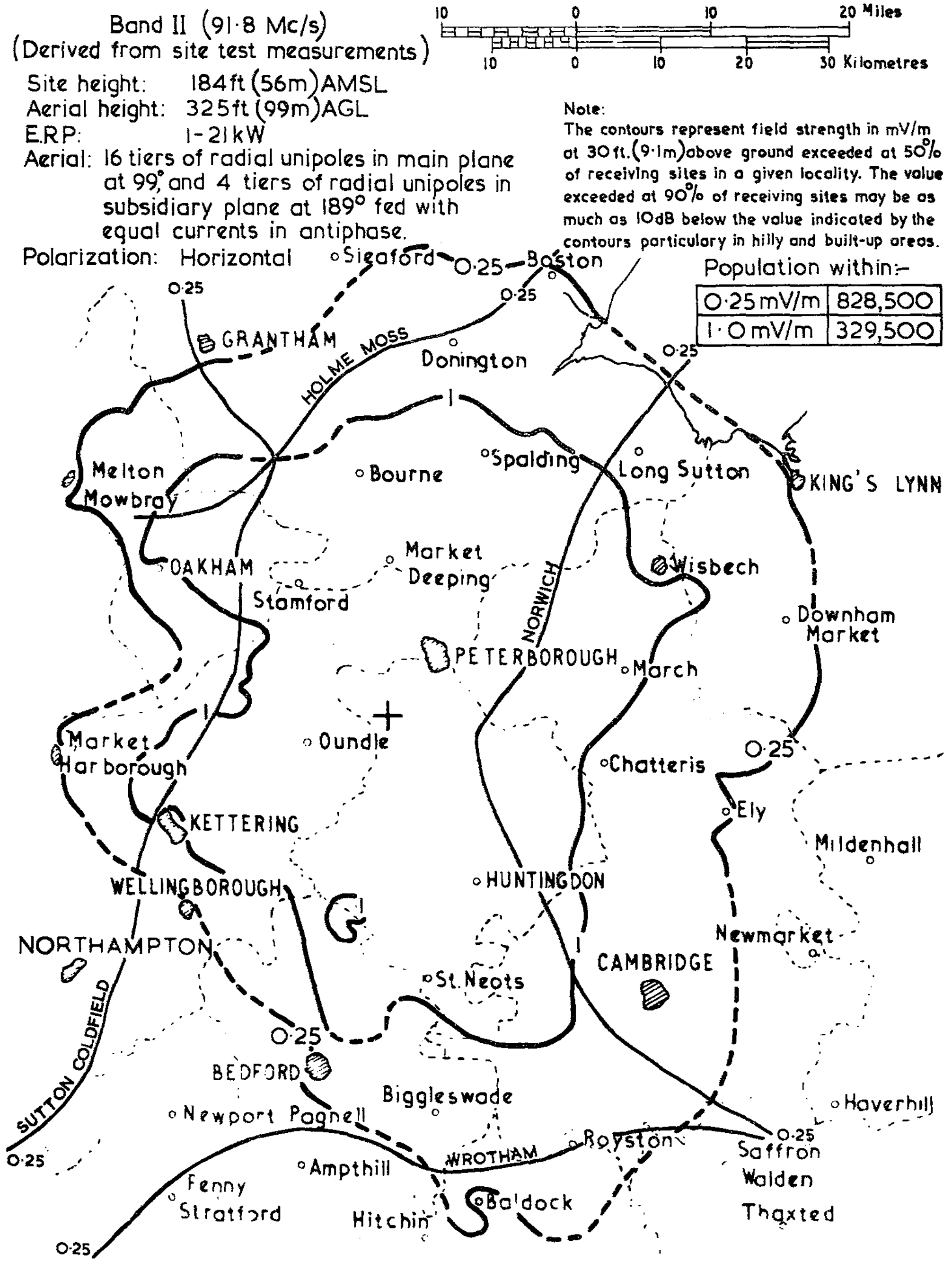
Band II (91·8 Mc/s)
(Derived from site test measurements)

Site height: 184 ft (56 m) AMSL
Aerial height: 325 ft (99 m) AGL
E.R.P: 1-21 kW
Aerial: 16 tiers of radial unipoles in main plane at 99° and 4 tiers of radial unipoles in subsidiary plane at 189° fed with equal currents in antiphase.
Polarization: Horizontal

Note:
The contours represent field strength in mV/m at 30 ft. (9·1 m) above ground exceeded at 50% of receiving sites in a given locality. The value exceeded at 90% of receiving sites may be as much as 10 dB below the value indicated by the contours particulary in hilly and built-up areas.

Population within:-

0·25 mV/m	828,500
1·0 mV/m	329,500



The proposed Band II transmitter will provide a good service in the Peterborough area but there will be a gap between the existing service areas of Wrotham and Sutton Coldfield. To site the Peterborough transmitter further south would only provide a partial solution to serving this area at the expense of the area south-west of The Wash and it is concluded that Morborne Hill is the best available site for the proposed television and v.h.f. sound transmitters to serve the Peterborough area.

TABLE 2. (V.H.F. Sound Service)

Field strength in mV/m at 30 ft (9·1 m) A.G.L.

E.R.P. = 1·0–21 kW

Town	Value of field strength exceeded at stated percentage of localities			Town	Value of field strength exceeded at stated percentage of localities		
	10%	50%	90%		10%	50%	90%
Baldock	0·38	0·21	0·13	March	1·4	1·0	0·55
Bedford	0·39	0·25	0·17	Market Harborough	0·26	0·19	0·13
Biggleswade	0·75	0·67	0·3	Melton Mowbray	0·21	0·15	0·13
Boston	0·48	0·32	0·25	Oakham	1·2	1·0	0·52
Bourne	1·8	1·4	0·94	Oundle	15	7·5	4·2
Cambridge	0·4	0·32	0·28	Peterborough	30	15	12
Chatteris	1·1	0·67	0·44	Royston	0·75	0·45	0·23
Ely	0·44	0·27	0·13	Rushden	1·1	0·5	0·23
Godmanchester	2·8	1·7	1·1	Spalding	1·8	1·25	0·87
Grantham	0·23	<0·16	<0·16	Stamford	6·2	2·9	1·4
				St. Ives	1·4	1·2	0·7
Huntingdon	2·8	1·8	1·4	St. Neots	1·5	1·0	0·6
Kettering	1·6	0·75	0·38	Whittlesey	9·5	5·5	3·4
King's Lynn	0·27	0·23	0·18	Wisbech	1·3	0·88	0·56

APPENDIX

Latitude:	52° 30′ 26″ N
Longitude:	00° 20′ 30″ W
National Grid Reference:	TL (52)/12559128
Site Height:	184 ft (56 m) a.m.s.l.

MV